

ANTIVIRAL AND ANTIBACTERIAL ACTIVITIES OF EXTRACTS FROM EIGHT PLANTS

5 The present invention provides biologically active compositions in the fields of medicine and pharmacology. In particular, the invention relates to extracts from GHX-2, GHX-4, GHX-6, GHX-7, GHX-20, GHX-26, and GHX-27 that inhibit DNA, RNA, or both DNA and RNA viruses including the etiological agent of Acquired Immune Deficiency Syndrome (AIDS) as well as opportunistic viral infections seen in AIDS. The invention further relates to extracts from GHX-2, GHX-8, GHX-20, GHX-26, and GHX-27 that inhibit bacteria.

10 The acquired immune deficiency syndrome (AIDS) is caused by the lentivirus, human immunodeficiency virus (HIV), which establishes latency in infected hosts (Sarngadharan et al, 1984; Wong-Staal & Gallo, 1985). The incapacitating effect of this virus on the host immune system renders the infected individuals prone to a host of opportunistic infections. The major opportunistic viral infections in AIDS are herpes simplex virus (HSV), varicella-zoster virus (VZV), and human cytomegalovirus (HCMV) (Egbert et al, 1980; Mintz et al, 1983; Frank & Raicht, 1984; Quinnan et al, 1984). The incidence of HCMV infection among AIDS patients is particularly high (Lerner & Tapper, 1984) and the infection can take many forms, including retinitis, pneumonia, colitis, and various syndromes (Egbert et al, 1980; Lerner & Tapper, 1984; Meiselman et al, 1985).

20 Nucleoside analogs have received considerable attention as anti-HIV drugs. Foremost among these are 3'-azido-2',3'-dideoxythymidine (ddAzThd), 2',3'-dideoxycytidine (ddCyd), and 2',3'-dideoxyinosine (ddIno) (De Clercq, 1986; Tuazon & Labriola, 1987; Sandstrom & Kaplan, 1987; Eriksson et al, 1989; Donovan et al, 1991; Johnson et al, 1991; Dickover et al, 1992; Meng et al, 1992). Other major therapeutic agents that have been evaluated for their anti-HIV activities are Suramin, trisodium phosphonoformate (PFA), antimoniotungstate (HPA-23), interferons, and photoactive plants like *Hypericum perforatum* (De Clercq, 1986;

Tuazon & Labriola, 1987; Hudson & Towers, 1991; Hudson et al, 1991).

None of the nucleoside analogs used to treat AIDS has any effect on any of the major opportunistic viral infections and would have to be combined with drugs like acycloguanosine (acyclovir, ACV) that are effective against the herpes viruses. PFA is effective against both HIV and herpes viruses but it has been shown to produce resistant mutants in vitro (Eriksson & Oberg, 1979) and accumulates in the bone (Hovi, 1980). The photoactive plants and interferon have broad spectrum activities against HIV and the herpes viruses but their toxicities mitigate against their systemic use (Hudson & Towers, 1991; Sandstrom & Kaplan, 1987). Other major plant products that have exhibited activities against HIV are extracts of pine cone (Lai et al, 1990; Takayama et al, 1991), plants containing lectin (Bazarini et al, 1992), cactus (Skinner & Ezra, 1993), and several Chinese herbal plants (Ho & Li, 1991).

Many families in Ghana have some knowledge of the use of some plants for the treatment of diseases. The traditional use of plants for the treatment of diseases stands the risk of extinction or adulteration unless efforts are made to document and research into such knowledge. The emerging new viral diseases without any available therapies makes it urgent therefore for the identification and testing of plants traditionally used in Ghana and elsewhere to treat viral diseases.

Several plants were collected from Ghanaian families who claimed ancestral knowledge of the use of such plants against genital herpes and shingles. A few other plants were randomly collected. Extracts of the plants were tested against HIV, herpes viruses, and some other viruses that afflict mankind. In addition, their effects on bacteria were tested.

Extracts of seven (7) out of thirty (30) plants (see Table 1), some of which are traditionally claimed as anti-infective

drugs, were found to be effective in vitro against some or all of the following viruses: HIV, HSV, CMV, poliovirus, measles virus, and yellow fever virus. Six (6) plants were also inhibitory to some bacteria with two (2) of them being comparable to penicillin G and streptomycin sulfate.

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This invention teaches that extracts of species of any of the eight (8) plants have a at least one pharmacologically active component, biological metabolite, derivative thereof, or a combination of the above against all or some of the following: DNA, RNA, or both DNA and RNA viruses, as well as some bacterial opportunistic infections found in immunosuppressed patients as seen in AIDS. The invention also teaches that extracts of species of any of these plants have at least one pharmacologically active component, biological metabolite, derivative thereof, or a combination of the above against some viral and some bacterial infections in immunocompetent patients.

By the term "HIV", is meant the commonly designated HIV series (human immunodeficiency virus) formerly called HTLV, LAV and ARV, and species thereof.

20 Similarly, the term "AIDS" shall refer to any illness or syndrome caused directly or indirectly by HIV.

Again, the term "opportunistic viral and bacterial infections in AIDS" shall refer to viral infections such as CMV and HSV types 1 and 2, and bacterial infections such as Mycobacterium tuberculosis and Salmonella bacteremia that take opportunity of immunosuppression in AIDS to establish infection in the host.

And again, the term "GHX" refers to Ghanaian plants discussed in this invention.

It is an object of the present invention to employ the plant extracts as therapeutic agents in hosts infected with HIV. In vitro studies and ex vivo studies, including the antiviral indices